



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/037,592	01/02/2002	Bohuslav Rychlik	42390P13149	6341

8791 7590 01/30/2006

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER

HUISMAN, DAVID J

ART UNIT	PAPER NUMBER
----------	--------------

2183

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/037,592

Applicant(s)

RYCHLIK ET AL.

Examiner

David J. Huisman

Art Unit

2183

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 39-58 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 39-58 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/30/2005
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

1. Claims 39-58 have been examined.

Papers Submitted

2. It is hereby acknowledged that the following papers have been received and placed of record in the file: Amendment as received on 11/25/2005 and IDS as received on 11/30/2005.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 39-41, 43-44, and 47-55 are rejected under 35 U.S.C. 102(e) as being anticipated by Gschwind et al., U.S. Patent No. 6,513,109 (as applied in a previous Office Action and herein disclosed as Gschwind).

5. Referring to claim 39, Gschwind has taught an apparatus comprising:

- a) a processor to store predicate values in a first register file including a first plurality of predicate registers. See Fig.7, component 405, and column 8, lines 4-7, and note the predicate future file, which holds speculative values for instructions that have not yet retired.
- b) the processor to write predicate values to a second register file including a second plurality of predicate registers in response to a first instruction. See Fig.7, component 410, and column 8,

Art Unit: 2183

lines 4-7. Note that a first instruction, such as a compare (cmp) instruction shown in column 18, line 58, writes to an architectural predicate register in the architected predicate file when it is retired.

c) the processor to access the first register file in response to a second instruction pending with the first instruction and having a data dependency with the first instruction. See column 10, lines 8-24, and note that when encountering a second (addi) instruction (column 18, line 60), which is dependent on the predicate-writing “cmp” instruction, if the “cmp” has not yet retired, then the predicate future file will be accessed to get the speculative predicate cr1 so the addi does not need to stall.

6. Referring to claim 40, Gschwind has taught an apparatus as described in claim 39. Gschwind has further taught that the processor is to maintain a select register to identify a register file to be allocated. Note that select registers are maintained in instruction memory. Select registers are the registers in the instructions which identify the register file to be selected for use by that instruction. For instance, in column 18, line 58, cr1 (in the cmp instruction) is a select register which says “select the predicate register file”

7. Referring to claim 41, Gschwind has taught an apparatus as described in claim 39. Gschwind has further taught that the processor is to allocate the second register file in response to the first instruction. Clearly, when an instruction indicates that registers are to be read/written, then the register file having those registers are allocated for use by the instruction.

8. Referring to claim 43, Gschwind has taught an apparatus as described in claim 39. Gschwind has further taught that the processor is to deallocate the first register file. See column 22, lines 19-23.

Art Unit: 2183

9. Referring to claim 44, Gschwind has taught an apparatus as described in claim 39.

Gschwind has further taught that the processor is to copy predicate values from the first register file to the second register file. See column 22, lines 15-19.

10. Referring to claim 47, Gschwind has taught an apparatus as described in claim 39.

Gschwind has further taught that the processor is to write to the second register file in response to the first register file having a predicate value to be written by a pending instruction. See column 8, lines 4-7, and recall that the first file holds speculative results (before instruction retirement) and the second file holds true results (after instruction retirement). Consequently, when an instruction writes to the first file, it will ultimately write to the second file as well when it finishes.

11. Referring to claim 48, the apparatus of claim 39 performs the method of claim 48.

Consequently, claim 48 is rejected for the same reasons set forth in the rejection of claim 39.

12. Referring to claim 49, Gschwind has taught a method as described in claim 48.

Furthermore, the apparatus of claim 41 performs the method of claim 49. Consequently, claim 49 is rejected for the same reasons set forth in the rejection of claim 41.

13. Referring to claim 50, Gschwind has taught a method as described in claim 48.

Furthermore, the apparatus of claim 43 performs the method of claim 50. Consequently, claim 50 is rejected for the same reasons set forth in the rejection of claim 43.

14. Referring to claim 51, Gschwind has taught a method as described in claim 48.

Furthermore, the apparatus of claim 44 performs the method of claim 51. Consequently, claim 51 is rejected for the same reasons set forth in the rejection of claim 44.

15. Referring to claim 52, Gschwind has taught a method as described in claim 48. Furthermore, the apparatus of claim 47 performs the method of claim 52. Consequently, claim 52 is rejected for the same reasons set forth in the rejection of claim 47.

16. Referring to claim 53, the processor of claim 39 operates the same as the processor of claim 53. Consequently, claim 53 is rejected for the same reasons set forth in the rejection of claim 39. In addition, claim 53 requires code on a computer readable medium to make the processor operate as claimed. Clearly, all processors operate based on the instructions that they execute. It should also be noted that Gschwind has taught storing instructions. See Fig.7, component 310, for instance.

17. Referring to claim 54, Gschwind has taught a method as described in claim 53. Furthermore, claim 54 is rejected for the same reasons set forth in the rejection of claim 44.

18. Referring to claim 55, Gschwind has taught a method as described in claim 53. Furthermore, claim 55 is rejected for the same reasons set forth in the rejection of claim 47.

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claims 42, 45-46, and 56-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gschwind, as applied above.

Art Unit: 2183

21. Referring to claim 42, Gschwind has taught an apparatus as described in claim 39.

Gschwind has taught a reservation station in column 10, lines 33-36 (which tracks resources), but Gschwind has not explicitly taught that the processor is to maintain a free file list to identify a register file to be allocated. However, Official Notice is taken that it is well known that the availability of register operands is tracked so that dependencies may be properly satisfied. More specifically, a list exists in a reservation station (which is a more complex scoreboard) that tracks when register operands become available for a particular instruction. When registers in the list become available for use, then the corresponding register file (which contains the needed registers) is free to be allocated to the instruction using those registers. Reservation stations/scoreboards are used to implement out-of-order execution, which increases throughput, as it is more efficient than in-order execution. Consequently, in order to increase throughput, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gschwind to include a free list to identify a register file to be selected.

22. Referring to claim 45, Gschwind has taught an apparatus as described in claim 39.

Gschwind has not explicitly taught that the processor is to maintain a scoreboard to identify any predicate values in the first register file to be written by a pending instruction. However, Official Notice is taken that scoreboards and their advantages are well known and expected in the art. A scoreboard is used to ensure that hazards are avoided while letting instructions execute out-of-order, which increases throughput and is employed by Gschwind. A scoreboard tracks registers that are to be written to and registers that are to be read from. By tracking reads and writes, the scoreboard knows when registers are busy (when they can't be used by another instruction) or available (when they may be used by another instruction), and uses this information to schedule

instructions out of order and avoid hazards. As a result, in order to avoid hazards, such as a WAW hazard, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gschwind to include a scoreboard for identifying predicates in the first file to be written.

23. Referring to claim 46, Gschwind has taught an apparatus as described in claim 39.

Gschwind has not explicitly taught that the processor is to stall a third instruction with which a pending instruction to write a predicate value to the first register file has a data dependency.

However, Official Notice is taken that stalling instructions in response to unresolved data dependencies is well known and expected in the art. More specifically, while many measures are taken to reduce stalling, sometimes it cannot be avoided. If an instruction needs to read a register that has not yet been written as required, then that instruction must be stalled or else it will read an incorrect value from the register. As a result, stalling overcomes such corruption, and consequently, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gschwind to stall a third instruction which is dependent on a pending write.

24. Referring to claim 56, Gschwind has taught a system comprising:

a) a processor to store predicate values in a first register file including a first plurality of predicate registers. See Fig.7, component 405, and column 8, lines 4-7, and note the predicate future file, which holds speculative values for instructions that have not yet retired.

b) the processor to write predicate values to a second register file including a second plurality of predicate registers in response to a first instruction. See Fig.7, component 410, and column 8, lines 4-7. Note that a first instruction, such as a compare (cmp) instruction shown in column 18,

Art Unit: 2183

line 58, writes to an architectural predicate register in the architected predicate file when it is retired.

c) the processor to access the first register file in response to a second instruction pending with the first instruction and having a data dependency with the first instruction. See column 10, lines 8-24, and note that when encountering a second (addi) instruction (column 18, line 60), which is dependent on the predicate-writing “cmp” instruction, if the “cmp” has not yet retired, then the predicate future file will be accessed to get the speculative predicate cr1 so the addi does not need to stall.

d) Gschwind has not taught a disk drive coupled to the processor. However, Official Notice is taken that disk drives and their advantages are well known and expected in the art. That is, a disk drive is a large collection of storage which is slower, and consequently, usually less-expensive, than internal memory. The storage may be used to hold applications that are not currently running along with any other type of data used by the system. As a result, in order to supply the system of Gschwind with cheap mass storage, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gschwind such that a disk drive is coupled to the processor.

25. Referring to claim 57, Gschwind has taught a method as described in claim 56.

Furthermore, claim 57 is rejected for the same reasons set forth in the rejection of claim 44.

26. Referring to claim 58, Gschwind has taught a method as described in claim 56.

Furthermore, claim 58 is rejected for the same reasons set forth in the rejection of claim 47.

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David J. Huisman whose telephone number is (571) 272-4168. The examiner can normally be reached on Monday-Friday (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2183

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DJH
David J. Huisman
January 18, 2006



EDDIE CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100